

Subdivided Module Catalogue for the Subject

Physics

as a minor in a Bachelor's degree programme (60 ECTS credits)

Examination regulations version: 2008 Responsible: Faculty of Physics and Astronomy

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Course of Studies - Contents and Objectives

The goal of the studies is it to mediate knowledge on the most important subsections of physics and to make the students familiar with the methods of physical scientific and physical thinking and working. By training of analytic thinking abilities the students acquire the ability to deal later with the various fields of applications and to compile the basic knowledge in particular necessary for a consecutive Bachelor and Master course of studies. Therefore the main emphasis is put on the understanding of the fundamental experimental and theoretical physical terms and laws as well as on basic scientific methods and the development of the typical scientific thinking and working structures. During the Bachelor thesis the student should work on a thematic and temporally limited experimental or theoretical engineering-scientific task in the field of experimental or theoretical physics using well-known procedures and scientific criteria under guidance to a large extent independently.



Abbreviations used

Course types: \mathbf{E} = field trip, \mathbf{K} = colloquium, \mathbf{O} = conversatorium, \mathbf{P} = placement/lab course, \mathbf{R} = project, \mathbf{S} = seminar, \mathbf{T} = tutorial, $\ddot{\mathbf{U}}$ = exercise, \mathbf{V} = lecture

Term: **SS** = summer semester, **WS** = winter semester

Methods of grading: **NUM** = numerical grade, **B/NB** = (not) successfully completed

Regulations: **(L)ASPO** = general academic and examination regulations (for teaching-degree programmes), **FSB** = subject-specific provisions, **SFB** = list of modules

Other: **A** = thesis, **LV** = course(s), **PL** = assessment(s), **TN** = participants, **VL** = prerequisite(s)

Conventions

Unless otherwise stated, courses and assessments will be held in German, assessments will be offered every semester and modules are not creditable for bonus.

Notes

Should there be the option to choose between several methods of assessment, the lecturer will agree with the module coordinator on the method of assessment to be used in the current semester by two weeks after the start of the course at the latest and will communicate this in the customary manner.

Should the module comprise more than one graded assessment, all assessments will be equally weighted, unless otherwise stated below.

Should the assessment comprise several individual assessments, successful completion of the module will require successful completion of all individual assessments.

In accordance with

the general regulations governing the degree subject described in this module catalogue:

ASPO2007

associated official publications (FSB (subject-specific provisions)/SFB (list of modules)):

16-Apr-2009 (2009-30)

This module handbook seeks to render, as accurately as possible, the data that is of statutory relevance according to the examination regulations of the degree subject. However, only the FSB (subject-specific provisions) and SFB (list of modules) in their officially published versions shall be legally binding. In the case of doubt, the provisions on, in particular, module assessments specified in the FSB/SFB shall prevail.

The subject is divided into

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Abbreviation	Module title		Method of	nage
	Moulle lille	credits	grading	page
Compulsory Courses (40 l	ECTS credits)			
Experimental Physics (10	6 ECTS credits)			
11-E1-072-m01	11-E1-072-mo1 Experimental Physics 1 (Mechanics, Thermodynamics, Waves and Oscillations)			10
11-E2-072-m01	Experimental Physics 2 (Electrics and Magnetism)	8	NUM	11
Theoretical Physics (16	ECTS credits)			
11-T1-072-m01	Theoretical Physics 1 (Theoretical Mechanics)	8	NUM	23
11-T2-072-m01	Theoretical Physics 2 (Theoretical Electrostatics and Elektrody- namics)	8	NUM	24
Lab Course Physics (8 E	CTS credits)			
11-PFR-072-m01	Measurements and Data Analysis	2	NUM	6
	Advanced Undergraduate Laboratory (Classical Mechanics,			
11-PGA-NN-0/2-1101	Thermodynamics, Basic Circuitry)	4	D/ND	21
11-PGB-NRN-072-m01	Advanced Undergraduate Laboratory (Optics, Basic Semicon- ductor Circuits)	2	B/NB	22
Compulsory Electives (20 E	CTS credits)			
Experimental Physics				
11-E3-072-m01	11-E3-072-mo1 Experimental Physics 3 (Optics, Quantum Phenomena, Intro-		NUM	12
11-E6-072-m01	Nuclear and Elementary Particle Physics	4	NUM	15
	Experimental Physics 7 (Solid State Phenomena [Semiconduc-			
11-E7-072-m01	tor, Superconductivity, Magnetism])		NUM	16
11-E5-082-m01	Experimental Physics 5 (Introduction to Solid State Physics)	8	NUM	14
11-E4-082-m01	Experimental Physics 4 (Physics of Atoms and Molecules)	6	NUM	13
Theoretical Physics				
11-T3-072-m01	Theoretical Physics 3 (Theoretical Quantum Mechanics)	8	NUM	25
11-T4-072-m01	Theorectical Physics 4 (Theoretical Thermodynamics and Stati- stics)	8	NUM	26
11-MKS-082-m01	Introduction Course Mathematics	3	B/NB	8
Lab Course Physics				
11-PHS-072-m01	Main Seminar Experimental / Theoretical Physics	2	NUM	19
Physics of Nanostructure	5			
11-N1-072-m01	Basics of NanostructureTechnology	6	NUM	18
11-N2-082-m01	Basic electronics with laboratory course	6	NUM	17
Applied Physics				
11-A1-072-m01	Computational Physics	6	NUM	7
11-A3-072-m01	Laboratory and Measurement Technology	6	NUM	20
11-A4-072-m01	Astrophysics	6	NUM	5
11-A2-081-m01 Electronics		6	NUM	9

Module title				Abbreviation		
Astrophysics					11-A4-072-m01	
Module	e coord	inator		Module offered by		
Managi and Ast	ing Dire trophys	ector of the Institute of Th sics	eoretical Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)		
6	nume	rical grade		•		
Duratio	n	Module level	Other prerequisites			
Induct creatOther precugatives1 semesterundergraduateAdmission prerequisite to assessment: successful completion of approx 50% of exercises. Certain prerequisites must be met to qualify for admiss sion to assessment. The lecturer will inform students about the respective ve details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration fo assessment into effect. Students who meet all prerequisites will be ad- mitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification 					successful completion of approx. must be met to qualify for admis- orm students about the respecti- . Registration for the course will ek admission to assessment. If n for admission to assessment urer will put their registration for eet all prerequisites will be ad- the subsequent semester. For I have to obtain the qualification e scales in outer space, telesco- stages of stellar evolution, inter- e, galaxies, active galactic nuclei, of the early universe, primordial	
nucleos	synthes	sis, cosmic microwave ba	ckground radiation,	structure formation,	inflation	
Intende	ed learı	ning outcomes				
The stu physica ons. Th lopmer	dents a al obse ey kno at.	are familiar with the mod rvations and evaluations w the structure of the uni	ern world view of Ast . They are able to use verse, e.g. of stars ar	rophysics. They know these methods to p nd galaxies and unde	w methods and tools for astro- lan and analyse own observati- erstand the process of their deve-	
Course	s (type	, number of weekly conta	ct hours, language —	· if other than Germa	n)	
V + S (r	infor	mation on SWS (weekly o	contact hours) and co	ourse language availa	able)	
Methoo ster, in	l of ass formati	essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
written examination (approx. 120 minutes)						
Allocat	ion of p	olaces				
Only as	Only as part of pool of general key skills (ASQ): 15 places. Places will be allocated by lot.					
Additio	nal inf	ormation				
Referre	d to in	LPO I (examination regu	lations for teaching-o	legree programmes)		

Module title					Abbreviation
Measu	rement	s and Data Analysis			11-PFR-072-m01
Module	e coord	inator		Module offered by	
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)	
2	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	Its				
Types of viation	of error, , distrik	error approximation and oution functions, significa	l propagation, graphs ance tests, writing of	s, linear regression, a lab reports and publ	average values and standard de- ications.
Intend	ed lear	ning outcomes			
In this mental	module work, o	e, the students acquire su error propagation and the	ubject-specific transfe principles of statisti	erable skills. They ha	we knowledge of practical experi-
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)
V + Ü (I	no infoi	mation on SWS (weekly o	contact hours) and co	ourse language avail	able)
Metho ster, in	d of ass formati	s essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
written	exami	nation (approx. 120 minu	tes)		
Allocation of places					
Additional information					
Referred to in LPO I (examination regulations for teaching-degree programmes)					

Module title				Abbreviation	
Compu	tationa	ll Physics			11-A1-072-m01
Module	e coord	inator		Module offered by	
Managi and Ast	ing Dire trophys	ector of the Institute of Th sics	eoretical Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
6	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts				
Introdu sical pr	ction to	o two of the programming s with computer program	g languages relevant mes.	for students of Physi	ics and Engineering, solving phy-
Intende	ed lear	ning outcomes			
The stu skills ir	dents l 1 worki	have acquired the followi ng with computers, know	ng transferable skills ledge of algorithms t	: Basic knowledge o o solve numeric phy	f two programming languages, sical problems.
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)
V + Ü (r	no infor	rmation on SWS (weekly o	contact hours) and co	ourse language avail	able)
Methoo ster, in	l of ass formati	sessment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
written	examiı	nation (approx. 120 minu	tes)		
Allocat	ion of p	olaces			
Additional information					
Referred to in LPO I (examination regulations for teaching-degree programmes)					

Module title				Abbreviation		
Introdu	uction C	Course Mathematics			11-MKS-082-m01	
Module	e coord	inator		Module offered by		
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)		
3	(not) s	successfully completed				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	Its					
Princip duction	les of n 1 to and	nathematics and basic ca I preparation of the mod	alculation methods b ules of Theoretical Ph	eyond the school cu sics and Experimer	rriculum, especially for the intro- ntal Physics.	
Intend	ed lear	ning outcomes				
The stu require	idents l d in Th	have knowledge of the pr eoretical and Experiment	rinciples of mathema al Physics.	tics and elementary	calculation methods which are	
Course	s (type	, number of weekly conta	ict hours, language –	- if other than Germa	n)	
V (no ii	nformat	tion on SWS (weekly cont	act hours) and cours	e language available		
Metho ster, in	d of ass formati	sessment (type, scope, la on on whether module c	inguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
written	exami	nation (approx. 120 minu	tes)			
Allocation of places						
Additional information						
Referre	ed to in	LPOI (examination regu	lations for teaching-o	degree programmes)		

Module title			Abbreviation		
Electronics					11-A2-081-m01
Module	e coord	inator		Module offered by	
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	and Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts				
Princip techno	les of p logy.	assive and active electro	onic components and	their application in	analogous and digital circuit
Intende	ed lear	ning outcomes			
The stu circuit	idents l techno	have knowledge of the pi logy.	actical setup of elect	ronic circuits from th	ne field of analogous and digital
Course	s (type	, number of weekly conta	ict hours, language –	- if other than Germa	ın)
V + Ü (r	no infoi	mation on SWS (weekly	contact hours) and co	ourse language avail	able)
Metho ster, in	d of ass formati	essment (type, scope, la on on whether module c	inguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
written	exami	nation (approx. 90 minut	es)		
Allocation of places					
Additional information					
Referred to in LPO I (examination regulations for teaching-degree programmes)					

Module title				Abbreviation	
Experin	nental	Physics 1 (Mechanics, Th	ermodynamics, Wav	es and Oscillati-	11-E1-072-m01
ons)		•		AA 1 1 66 1 1	
Module	coord	inator		Module offered by	
Managi	ng Dire	ector of the Institute of Ap	plied Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. con	pl. of module(s)	
8	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts				
Physica	ıl laws	of mechanics, vibrations	and waves, thermod	ynamics	
Intende	ed leari	ning outcomes			
The stu	dents ı	understand the basic con	texts and principles	of mechanics, vibrat	ion, waves and thermodynamics.
Course	s (type	, number of weekly conta	ct hours, language –	if other than Germa	n)
V + Ü (r	io infor	mation on SWS (weekly o	contact hours) and co	ourse language avail	able)
Methoo ster, inf	l of ass formati	s essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
written	examiı	nation (approx. 120 minu	tes)		
Allocat	ion of p	olaces			
Additional information					
Referre	Referred to in LPO I (examination regulations for teaching-degree programmes)				

Module title			Abbreviation			
Experin	Experimental Physics 2 (Electrics and Magnetism)				11-E2-072-m01	
Module	e coord	inator		Module offered by	·	
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	and Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
8	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	its					
Physica	al laws	of the science of electric	ity, magnetism, elect	romagnetic vibratior	is and waves	
Intend	ed lear	ning outcomes				
The stu vibratio	idents i ons and	understand the basic cor I waves.	ntexts and principles	of science of electric	ity, magnetism, electromagnetic	
Course	s (type	, number of weekly conta	ict hours, language –	- if other than Germa	n)	
V + Ü (I	no infoi	mation on SWS (weekly	contact hours) and co	ourse language avail	able)	
Metho ster, in	d of ass formati	sessment (type, scope, la on on whether module ca	inguage — if other th an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
written	exami	nation (approx. 120 minu	tes)			
Allocat	ion of p	olaces				
Additional information						
Referred to in LPO I (examination regulations for teaching-degree programmes)						

Module title				Abbreviation	
Experin	nental	Physics 3 (Optics, Quant	um Phenomena, Intr	oduction Atomic	11-E3-072-m01
Physics	5)				
Module	e coord	inator		Module offered by	
Managi	ng Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
8	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts				
Physica	al laws	of optics, quantum phen	omena, introduction	to Atomic Physics.	
Intende	ed lear	ning outcomes			
The stu Physics	dents l 5.	nave knowledge of the ba	asic contexts and prir	iciples of optics, qua	antum phenomena and Atomic
Course	s (type	, number of weekly conta	ct hours, language —	if other than Germa	n)
V + Ü (r	no infor	mation on SWS (weekly o	contact hours) and co	ourse language avail	able)
Methoo ster, in	l of ass formati	s essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
written	exami	nation (approx. 120 minu	tes)		
Allocation of places					
Additional information					
Referre	d to in	LPOI (examination regu	lations for teaching-c	legree programmes)	

Module title			Abbreviation			
Experir	Experimental Physics 4 (Physics of Atoms and Molecules) 11-E4-082-m01					
Module	e coord	inator		Module offered by		
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	ind Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
6	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
Physica	al laws	of Atomic and Molecular	Physics.			
Intende	ed learı	ning outcomes				
The stu Quantu well as Course	idents l im mec moleci s (type	have knowledge of the ba hanical atom model, one ules: Bonding models an , number of weekly conta	asic contexts and prine /multi-electron atom d elementary excitati act hours, language –	nciples of Atomic and is, electronic dipole ons: rotations, vibra - if other than Germa	d Molecular Physics (atoms: transitions, atoms in B field as tions, electronic excitations) in)	
V + Ü (r	no infor	mation on SWS (weekly	contact hours) and co	ourse language avail	able)	
Metho ster, in	d of ass formati	essment (type, scope, la on on whether module ca	inguage — if other than an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
written	examiı	nation (approx. 120 minu	tes)			
Allocation of places						
Additional information						
Referre	ed to in	LPOI (examination regu	lations for teaching-	degree programmes)		

Module title					Abbreviation	
Experin	Experimental Physics 5 (Introduction to Solid State Physics) 11-E5-082-m01					
Module	e coord	inator		Module offered by	· · · · · · · · · · · · · · · · · · ·	
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
8	nume	rical grade				
Duratio	on	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
Physica perties	al laws (free e	of solids: Bonding and si lectron gas)	tructure, lattice dynai	mics, thermal proper	ties, principles of electronic pro-	
Intend	ed lear	ning outcomes				
The stu mics, t	idents l hermal	have knowledge of the ba properties, principles of	asic contexts and prir electronic properties	nciples of solids: Bor (free electron gas)	nding and structure, lattice dyna-	
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)	
V + Ü (I	no infoi	mation on SWS (weekly	contact hours) and co	ourse language avail	able)	
Metho ster, in	d of ass formati	sessment (type, scope, la ion on whether module ca	inguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
written	exami	nation (approx. 120 minu	tes)			
Allocat	ion of p	olaces				
Additional information						
Referre	ed to in	LPOI (examination regu	lations for teaching-o	degree programmes)		

Module title			Abbreviation		
Nuclea	r and E	lementary Particle Physi	cs		11-E6-072-m01
Module	e coord	inator		Module offered by	
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
4	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts				
Physica	al laws	of Nuclear and Elementa	ry Particle Physics.		
Intende	ed lear	ning outcomes			
The stu	dents	have knowledge of the ba	asic contexts and prir	nciples of Nuclear an	d Elementary Particle Physics.
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)
V + Ü (r	no info	mation on SWS (weekly	contact hours) and co	ourse language avail	able)
Methor ster, in	d of ass formati	sessment (type, scope, la ion on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
written	exami	nation (approx. 120 minu	tes)		
Allocat	ion of _l	olaces			
Additional information					
Referred to in LPO I (examination regulations for teaching-degree programmes)					

Module title				Abbreviation	
Experimental Physics 7 (Solid State Phenomena [Semiconductor, Supercon-				11-E7-072-m01	
ductivity, Magnetism])					
coordi	nator		Module offered by		
ng Dire	ctor of the Institute of Ap	oplied Physics	Faculty of Physics a	ind Astronomy	
Metho	d of grading	Only after succ. com	npl. of module(s)		
numer	ical grade				
n	Module level	Other prerequisites			
ster	undergraduate				
S					
llaws	of solid-state phenomen	a (semiconductors, s	uperconductivity, m	agnetism)	
d learn	ing outcomes				
mi-con gical m r)	ductors: Doping effects, iodels, BCS model; magr	pn transitions, metal netism: Dia-, para- an	-semiconductor inte d ferromagnetism, n	rfaces; superconductivity: pheno- nean field description of magne-	
type,	number of weekly conta	ct hours, language —	- if other than Germa	in)	
o infor	mation on SWS (weekly o	contact hours) and co	ourse language avail	able)	
of ass ormati	essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
examir	nation (approx. 120 minu	tes)			
Allocation of places					
Additional information					
d to in	LPOI (examination regu	lations for teaching-o	degree programmes)		
	title ental I y, Mag coordi ng Dire Metho numer n ter l laws o d learr d lears h mi-con gical m o infor of ass ormati examir on of p nal info	title ental Physics 7 (Solid State Phy y, Magnetism]) coordinator ng Director of the Institute of Ap Method of grading numerical grade n Module level ter undergraduate s l laws of solid-state phenomen d learning outcomes dents have knowledge of the ba ni-conductors: Doping effects, gical models, BCS model; magr r) (type, number of weekly contated o information on SWS (weekly contated of assessment (type, scope, lated ormation on whether module cated examination (approx. 120 minuton on of places hal information	title tental Physics 7 (Solid State Phenomena [Semicond y, Magnetism]) coordinator trig Director of the Institute of Applied Physics Method of grading Only after succ. com numerical grade n Module level Other prerequisites ter undergraduate s I laws of solid-state phenomena (semiconductors, s d learning outcomes dents have knowledge of the basic contexts and prin mi-conductors: Doping effects, pn transitions, metal gical models, BCS model; magnetism: Dia-, para- an) (type, number of weekly contact hours, language — o information on SWS (weekly contact hours) and co of assessment (type, scope, language — if other tha ormation on whether module can be chosen to earn examination (approx. 120 minutes) on of places data information	title eental Physics 7 (Solid State Phenomena [Semiconductor, Supercon- y, Magnetism]) coordinator Module offered by ng Director of the Institute of Applied Physics Aethod of grading Only after succ. compl. of module(s) numerical grade n Module level Other prerequisites ter undergraduate s I laws of solid-state phenomena (semiconductors, superconductivity, m d learning outcomes dents have knowledge of the basic contexts and principles of electronic mi-conductors: Doping effects, pn transitions, metal-semiconductor inte gical models, BCS model; magnetism: Dia-, para- and ferromagnetism, n b (type, number of weekly contact hours, language — if other than Germa o information on SWS (weekly contact hours) and course language avail of assessment (type, scope, language — if other than German, examina o mation on whether module can be chosen to earn a bonus) examination (approx. 120 minutes) on of places b	

Module title			Abbreviation		
Basic electronics with laboratory course				11-N2-082-m01	
Module	e coord	inator		Module offered by	
Manag	ing Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	ind Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	Its				
Princip techno	les of p logy.	assive and active electro	onic components and	their application in	analogous and digital circuit
Intend	ed lear	ning outcomes			
The stu circuit	ıdents techno	have knowledge of the pilogy.	ractical setup of elect	ronic circuits from th	ne field of analogous and digital
Course	s (type	, number of weekly conta	ict hours, language –	- if other than Germa	ın)
V + P (r	no infor	mation on SWS (weekly o	contact hours) and co	ourse language avail	able)
Metho ster, in	d of ass formati	Sessment (type, scope, la on on whether module c	inguage — if other than an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
written	exami	nation (approx. 90 minut	es)		
Allocation of places					
Additional information					
Referred to in LPO I (examination regulations for teaching-degree programmes)					

Module title			Abbreviation		
Basics of NanostructureTechnology				11-N1-072-m01	
Modul	e coord	inator		Module offered by	
Manag	ing Dire	ector of the Institute of A	oplied Physics	Faculty of Physics a	ind Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
6	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ester	undergraduate			
Conter	nts				
Princip	les of p	oroducing, characterising	and applying nanost	tructures.	
Intend	ed lear	ning outcomes			
The stu ons of	udents nanost	have knowledge of the fu ructures.	ndamental propertie	s, technologies, cha	racterising methods and functi-
Course	s (type	, number of weekly conta	act hours, language –	- if other than Germa	n)
V + S (I	no infor	mation on SWS (weekly	contact hours) and co	ourse language avail	able)
Metho ster, in	d of ass formati	sessment (type, scope, la ion on whether module c	anguage — if other th an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
written	exami	nation (approx. 90 minut	es)		
Allocation of places					
Additional information					
Referred to in LPO I (examination regulations for teaching-degree programmes)					

Module title				Abbreviation	
Main Seminar Experimental / Theoretical Physics			cal Physics		11-PHS-072-m01
Module	e coord	inator		Module offered by	
Manag the Ins	ing Dire titute o	ectors of the Institute of <i>I</i> f Theoretical Physics and	Applied Physics and Astrophysics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)	
2	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts				
Current	issues	s of Theoretical/Experime	ental Physics.		
Intende	ed lear	ning outcomes			
The stu of Theo	dents retical	have knowledge of the so or Experimental Physics	cientific methods, wo	rk and presentation	techniques of a current question
Course	s (type	, number of weekly conta	act hours, language –	- if other than Germa	n)
S (no ir	format	tion on SWS (weekly con	tact hours) and cours	e language available	2)
Metho ster, in	d of ass formati	sessment (type, scope, la ion on whether module c	anguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
talk (ap	prox.	30 to 45 minutes) with di	scussion		
Allocation of places					
Additional information					
Referre	d to in	LPOI (examination regu	lations for teaching-	degree programmes)	

Module title				Abbreviation	
Laboratory and Measurement Technology					11-A3-072-m01
Module	coord	inator		Module offered by	
Managi	ng Dire	ector of the Institute of Ap	plied Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
6	nume	rical grade			
Duratio	n	Module level	Other prerequisites		
1 seme:	ster	undergraduate	Admission prerequisite to assessment: successful completion of app 50% of exercises. Certain prerequisites must be met to qualify for adr sion to assessment. The lecturer will inform students about the respe ve details at the beginning of the course. Registration for the course v be considered a declaration of will to seek admission to assessment. students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration assessment into effect. Students who meet all prerequisites will be a mitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualificat for admission to assessment anew.		
Conten	ts				
Introdu nics, cr	ction to yogeni	o electronic and optical n cs, light sources, spectro	neasuring methods o scopic methods and	f physical metrology measured value acq	, vacuum technology and cryoge- uisition.
Intende	ed leari	ning outcomes			
The stu cal met red valı	dents l rology, ue acqu	nave acquired the followi cryogenics and vacuum uisition.	ng transferable skills technology, cryogeni	: Electronic and opti cs, light sources, spo	cal measuring methods in physi- ectroscopic methods and measu-
Course	s (type	, number of weekly conta	ct hours, language —	if other than Germa	n)
V + Ü (r	no infor	mation on SWS (weekly o	contact hours) and co	ourse language avail	able)
Methoo ster, inf	l of ass formati	essment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
written examination (approx. 120 minutes)					
Allocation of places					
Only as part of pool of general key skills (ASQ): 15 places. Places will be allocated by lot.					
Additional information					
Referre	d to in	LPO I (examination regu	lations for teaching-c	legree programmes)	
		(, , , , , , , , , , , , , , , , , , ,			

Module title			Abbreviation		
Advanced Undergraduate Laboratory (Classical Mechanics, Thermodynamics,			11-PGA-NN-072-m01		
Basic C	ircuitry	()			
Module	e coord	inator		Module offered by	
Managi	ng Dire	ector of the Institute of Ap	oplied Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
4	(not) s	successfully completed			
Duratio	on d	Module level	Other prerequisites		
1 seme	ster	undergraduate	Recommended: 11-P	'FR	
Conten	ts				
Physica	al laws	of mechanics, thermodyr	namics, optics, scien	ce of electricity, vibra	ations and waves.
Intende	ed learn	ning outcomes			
The stu are able in a me	dents l e to ind asuren	nave knowledge and skill lependently plan and cor nent protocol.	ls of physical measur nduct experiments in	ing instruments and cooperation with otl	experimental techniques. They ners, and to document the results
Course	s (type,	, number of weekly conta	ict hours, language —	if other than Germa	n)
Beispiele aus Mechanik, Wärmelehre und Elektrik (Examples from Mechanics, Thermodynamics and Electricity, BAM): P (2 weekly contact hours) Klassische Physik (Classical Physics, KLP): P (2 weekly contact hours) Elektrizitätslehre und Schaltungen (Electricity and Circuits, ELS): P (2 weekly contact hours)					
Method	l of ass	essment (type, scope, la	inguage — if other tha	an German, examina	tion offered — if not every seme-
ster, in	formati	on on whether module ca	an be chosen to earn	a bonus)	
 This module has the following assessment components 1. Lab course in part 1: a) Preparing, performing and evaluating the experiments will be considered successfully completed if a Testat (exam) is passed. b) Talk (with discussion) to test the students' understanding of the physics-related contents of the course (approx. 30 minutes). 2. Lab course in part 2: a) Preparing, performing and evaluating the experiments will be considered successfully completed if a Testat (exam) is passed. b) Talk (with discussion) to test the students' understanding of the physics-related contents of the course (approx. 30 minutes). 					
Students must register for assessment components 1 and 2 online (registration deadline to be announced). Students will be offered one opportunity to retake element a) and/or element b). To pass an assessment compo- nent, they must pass both elements a) and b). To pass this module, students must successfully complete two out of the three courses. To pass this module, students must pass both assessment component 1 and assessment component 2.					
Allocation of places					
Additio	nal inf	ormation			
Referre	d to in	LPOI (examination regu	lations for teaching-c	legree programmes)	

Module title			Abbreviation		
Advanc	ed Und	lergraduate Laboratory (Optics, Basic Semico	nductor Circuits)	11-PGB-NRN-072-m01
Module	coord	inator		Module offered by	
Managi	ng Dire	ector of the Institute of Ap	plied Physics	Faculty of Physics a	nd Astronomy
ECTS	Metho	od of grading	Only after succ. com	pl. of module(s)	
2	(not) s	successfully completed			
Duratio	n	Module level	Other prerequisites		
1 semes	ster	undergraduate			
Conten	ts				
Physica and sto	l laws rage os	of atomic physics, nuclea scilloscopes.	ar physics and wave o	optics. Basic measur	ing methods using computers
Intende	ed learr	ning outcomes			
The stu are able in a me	dents ł e to ind asuren	nave knowledge and skill lependently plan and cor nent protocol.	s of physical measur nduct experiments in	ing instruments and cooperation with oth	experimental techniques. They ners, and to document the results
Courses	s (type,	, number of weekly conta	ct hours, language —	· if other than Germa	n)
Wellend Atom- u Comput	optik (F Ind Ker ter und	Physical Optics, WOP): P (nphysik (Atomic and Nuc Messtechnik (Computer	(2 weekly contact hou clear Physics, AKP): P s and Measurement T	urs) (2 weekly contact he Fechnology, CMT): P	ours) (2 weekly contact hours)
Method ster, inf	l of ass formati	e ssment (type, scope, la on on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
 This module has the following assessment components Lab course: a) Preparing, performing and evaluating the experiments will be considered successfully completed if a Testat (exam) is passed. b) Talk (with discussion) to test the students' understanding of the physics-related contents of the course (approx. 30 minutes). Students must register for assessment online (registration deadline to be announced). Students will be offered one opportunity to retake element a) and/or element b). To pass an assessment, students must pass both elements a) and b). To pass this module, students must successfully complete one out of the three courses. 					
Allocation of places					
Additional information					
Referre	d to in	LPOI (examination regu	lations for teaching-o	legree programmes)	

Module title			Abbreviation		
Theoretical Physics 1 (Theoretical Mechanics)				11-T1-072-m01	
coord	inator		Module offered by		
ng Dire rophys	ector of the Institute of Th ics	eoretical Physics	Faculty of Physics a	nd Astronomy	
Metho	od of grading	Only after succ. con	npl. of module(s)		
numei	rical grade				
n	Module level	Other prerequisites			
ter	undergraduate				
S					
ian me	chanics, Lagrangian med	chanics, Hamiltonian	equation of motion,	conservation laws.	
d learr	ning outcomes				
dents ł s.	nave knowledge of the pr	inciples of classical t	theoretical mechanic	cs and the required calculation	
(type,	number of weekly conta	ct hours, language –	- if other than Germa	n)	
o infor	mation on SWS (weekly o	contact hours) and co	ourse language avail	able)	
of ass ormati	essment (type, scope, la on on whether module ca	nguage — if other than be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
examir	nation (approx. 120 minu	tes)			
Allocation of places					
Additional information					
Referred to in LPO I (examination regulations for teaching-degree programmes)					
	title ical Ph ical Ph coording Dire ophys Metho numer ter s an me d learr lents h s. (type, o infor of ass ormati examir on of p nal info	title tical Physics 1 (Theoretical Mec coordinator ag Director of the Institute of The ophysics Method of grading numerical grade Module level ter undergraduate s an mechanics, Lagrangian mec d learning outcomes lents have knowledge of the press (type, number of weekly contar o information on SWS (weekly of of assessment (type, scope, lar ormation on whether module car examination (approx. 120 minu on of places lat information I to in LPO I (examination regu	title ical Physics 1 (Theoretical Mechanics) coordinator Ing Director of the Institute of Theoretical Physics ophysics Method of grading Only after succ. com numerical grade Module level Other prerequisites ter undergraduate s an mechanics, Lagrangian mechanics, Hamiltonian d learning outcomes lents have knowledge of the principles of classical fields (type, number of weekly contact hours, language p information on SWS (weekly contact hours) and co of assessment (type, scope, language if other theorem examination (approx. 120 minutes) on of places I to in LPO I (examination regulations for teaching-of and the transmission of teaching-of I to in LPO I (examination regulations for teaching-of I to in LPO I (examination I teaching-of I to in LPO I (examination I teaching-of I teaching I teaching	title ical Physics 1 (Theoretical Mechanics) Coordinator Module offered by and Director of the Institute of Theoretical Physics Method of grading Only after succ. compl. of module(s) numerical grade Module level Other prerequisites ter undergraduate S an mechanics, Lagrangian mechanics, Hamiltonian equation of motion, d learning outcomes lents have knowledge of the principles of classical theoretical mechanics, (type, number of weekly contact hours, language — if other than Germa to information on SWS (weekly contact hours) and course language avail of assessment (type, scope, language — if other than German, examination (approx. 120 minutes) bo of places lat information l to in LPO 1 (examination regulations for teaching-degree programmes)	

Module title				Abbreviation	
Theoretical Physics 2 (Theoretical Electrostatics and Elektrodynamics) 11-T2-072-m01					11-T2-072-m01
Module	e coord	inator		Module offered by	· · · · · · · · · · · · · · · · · · ·
Managing Director of the Institute of Theoretical Physics and Astrophysics			neoretical Physics	Faculty of Physics a	ind Astronomy
ECTS	Methe	od of grading	Only after succ. con	pl. of module(s)	
8	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts				
Electro	statics	, magnetostatics, Maxwe	ll equations, covariar	nt formulation, electr	odynamics and matter.
Intende	ed lear	ning outcomes			
The stu thods.	Idents	have knowledge of the p	inciples of classical (electrodynamics and	I the required calculation me-
Course	s (type	, number of weekly conta	ict hours, language –	- if other than Germa	ın)
V + Ü (r	no info	rmation on SWS (weekly	contact hours) and co	ourse language avail	able)
Metho ster, in	d of ass formati	sessment (type, scope, la ion on whether module c	inguage — if other than an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
written	exami	nation (approx. 120 minu	tes)		
Allocation of places					
Additional information					
Referred to in LPO I (examination regulations for teaching-degree programmes)					

Module title				Abbreviation		
Theoretical Physics 3 (Theoretical Quantum Mechanics)					11-T3-072-m01	
Module	e coord	inator		Module offered by		
Managi and Ast	ing Dire trophys	ector of the Institute of Th sics	eoretical Physics	Faculty of Physics a	nd Astronomy	
ECTS	Metho	od of grading	Only after succ. con	npl. of module(s)		
8	nume	rical grade				
Duratio	n	Module level	Other prerequisites			
1 seme	ster	undergraduate				
Conten	ts					
Limits o oscillat	of class or, ang	sical physics, Schrödinge gular momentum and spir	r equation, mathema n, hydrogen atom, ma	tical foundations of any-particle systems	quantum mechanics, harmonic	
Intende	ed lear	ning outcomes				
The stu	dents l	have knowledge of the pi	inciples of quantum	mechanics and the r	equired calculation methods.	
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	n)	
V + Ü (r	no infor	rmation on SWS (weekly	contact hours) and co	ourse language avail	able)	
Methoo ster, in	l of ass formati	sessment (type, scope, la ion on whether module c	inguage — if other th an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-	
written	exami	nation (approx. 120 minu	tes)			
Allocation of places						
Additional information						
Referred to in LPO I (examination regulations for teaching-degree programmes)						

Module title				Abbreviation	
Theorectical Physics 4 (Theoretical Thermodynamics and Statistics)11-T4-072-m01				11-T4-072-m01	
Module	e coord	inator		Module offered by	
Manag and As	ing Dire trophys	ector of the Institute of Th sics	eoretical Physics	Faculty of Physics a	ind Astronomy
ECTS	Methe	od of grading	Only after succ. con	npl. of module(s)	
8	nume	rical grade			
Duratio	on	Module level	Other prerequisites		
1 seme	ster	undergraduate			
Conten	ts				
Princip chanics	les of t s.	hermodynamics, fundam	ental theorems, ther	modynamic potentia	ls, principles of statistical me-
Intende	ed lear	ning outcomes			
The stu calcula	idents ition m	have knowledge of the pr ethods.	inciples of thermody	namics and statistic	al mechanics and the required
Course	s (type	, number of weekly conta	ct hours, language –	- if other than Germa	ın)
1) Ü + V	no info	rmation on SWS (weekly o	contact hours) and co	ourse language avail	able)
Metho ster, in	d of as: formati	sessment (type, scope, la ion on whether module ca	nguage — if other tha an be chosen to earn	an German, examina a bonus)	tion offered — if not every seme-
written	exami	nation (approx. 120 minu	tes)		
Allocation of places					
Additional information					
Referred to in LPO I (examination regulations for teaching-degree programmes)					